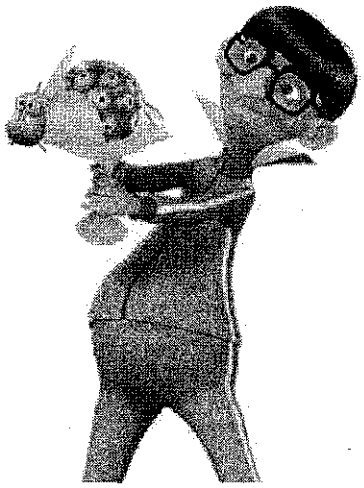
Precalculus Notes: Vectors

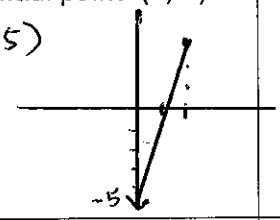
What is a scalar?	Examples height, length, volume, width
a quantity having magnitude (size) only NOT DIRECTION.	
What is a vector?	**Examples**
A quantity having magnitude and direction	-weight (on earth... why?) -displacement



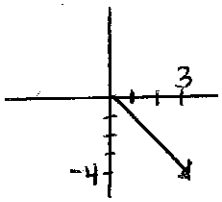
There are 4 different ways we will use to represent a vector:

1st: With a sketch

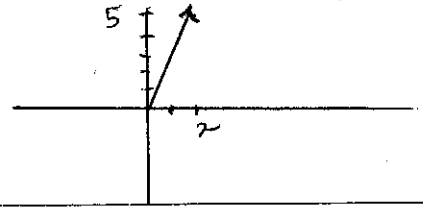
EX 1 : Draw a vector **v** with initial point (2, 3) and terminal point (0, -5)



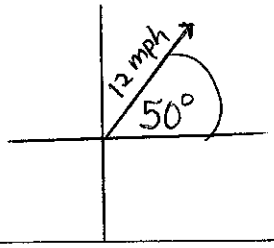
EX 2: Draw the vector with component form $\langle 3,-4\rangle$



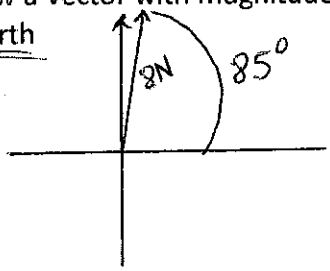
EX 3: Draw the vector given its linear combination form $2i+5j$



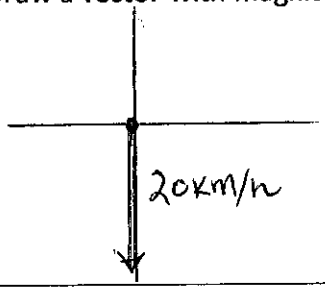
EX 4: Draw the vector with magnitude 12 mph at 50°



EX 5: Draw a vector with magnitude 8N at 5° east of north



EX 6: Draw a vector with magnitude 20 km/h due south



2nd: Using the component form $\langle x_2 - x_1, y_2 - y_1\rangle$ ORDER MATTERS!

EX 1: Find the component form of the vector with initial point (-1, 5) and terminal point (9, -2)	You try: Find the component form of the vector with initial point (11, -6) and terminal point (2, -1)
$\langle 9--1, -2-5\rangle$	$\langle 2-11, -1--6\rangle$
$\langle 10, -7\rangle$	$\langle -9, 5\rangle$

3rd: Using Linear Combinations Form: $(x_2 - x_1)i + (y_2 - y_1)j$

EX 1: Find the linear combination form of the vector with initial point (2, 5) and terminal point (-3,-2).

$(-3-2)i + (-2-5)j$

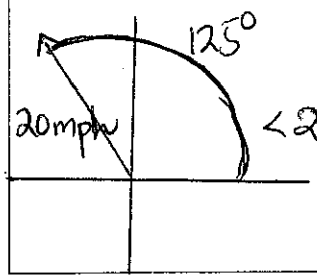
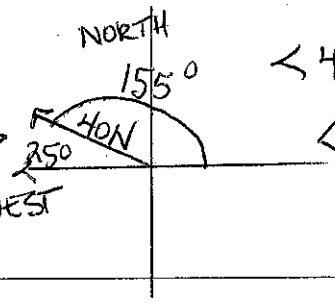
$-5i - 7j$

EX 2 : Change the component form of the vector $\langle 8, -3 \rangle$ to linear combinations form.

$8i - 3j$

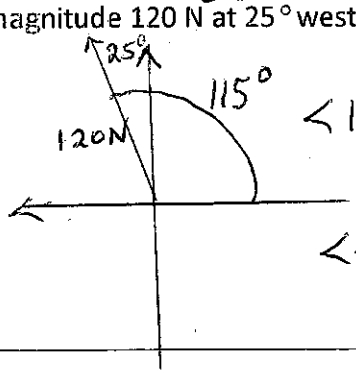
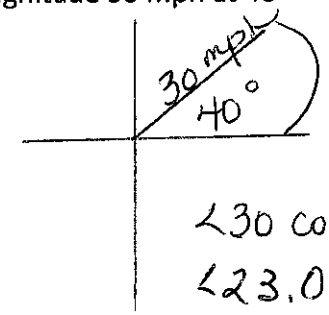
Sorry, I cut + pasted out of ORDER :(Having a not so good day

4th: Using the magnitude and direction

EX 1: 20 mph at 125°	EX 2: 40 N at 25° north of west
Find the component vector  $\langle 20\cos 125°, 20\sin 125° \rangle$ $\langle -11.5, 16.4 \rangle$	 $\langle 40\cos 155°, 40\sin 155° \rangle$ $\langle -36.3, 16.9 \rangle$

$\langle \text{magnitude} \cdot \cos\theta, \text{magnitude} \cdot \sin\theta \rangle$

Find component form of a vector given magnitude and direction: Use $\langle A\cos\theta, A\sin\theta \rangle$

EX 1: : Find the component form of a vector with magnitude 120 N at 25° west of north	EX 2: Find the component form of a vector with magnitude 30 mph at 40°
 $\langle 120\cos 115°, 120\sin 115° \rangle$ $\langle -50.7, 108.8 \rangle$	 $\langle 30\cos 40°, 30\sin 40° \rangle$ $\langle 23.0, 19.3 \rangle$

Finding the magnitude and direction of a vector given the component form

Magnitude: $\|\mathbf{v}\| = \sqrt{x^2 + y^2}$

To find direction, use right triangle trig! $\theta = \tan^{-1}\frac{y}{x}$

If your angle is in Q1, use the value in your calculator.

If your angle is in Q2 or Q3 ADD 180°

If your angle is in Q4 ADD 360°